## REMARKS

Claims 1-5, 10-15 and 17-19 are pending in this application. Claims 10-15, 17 and 18 have been withdrawn from consideration. Claims 2, 3, 6-9 and 16 have been canceled. Claims 1 and 4 are amended and claim 19 is added. The number of pending claim has been reduced

**Amendments**

Claims 1 has been amended to incorporate therein the substance of now-canceled claims 3, 6, 8 and 9 respectively, *i.e.,* claim 1 has been amended to indicate that the U-F resin in initially synthesized at a F:U mole ratio in the range of 1.5:1 to 3.2:1 (see paragraph **[22]**) and that **soy** protein (in an amount of 0.2% to 7% by weight of resin solids) is added as a resin modifier during synthesis of the U-F resin (see paragraph **[36]**). Claim 1 further specifies that the final F:U mole ratio of the adhesive binder (*e.g.,* as a consequence of back-added urea (see paragraph **[23]**)) is in the range of 0.6:1 to 1.6:1. Finally, claim 1 was amended to clarify that the amount of soy protein is based on the combined weight of U:F resin and soy protein, as described in paragraph **[39]** of the pending application.

Thus, claim 1 has been amended to emphasize the key features of the wood composite focusing particularly on the adhesive binder used in its consolidation and the U-F resin that is a key component of the adhesive binder. These features are responsible for the unexpected tackiness observed in the adhesive binder that produces the claimed wood composite. Claim 4 also has been amended simply to correct its dependency as a consequence of the cancellation of claim 3. New claim 19 also has been added to present the narrower range of protein usage preferred by applicants as defined in paragraph **[39]** of the application. This claim is presented as a dependent claim.

No new matter has been added as a result of these amendments.

Entry of the amendments under Rule 1.116 is requested. The number of claims has been reduced and no new issues have been introduced as the amendments merely incorporate

the limitations of previously considered dependent claims into claim 1. As a result, claim 1 is now presented in better form for appeal and by the amendment the potential issues for the appeal have been reduced. New claim 19, added as a dependent claim, also helps to focus the issues for any appeal.

**The Invention**

The present invention is based on the discovery that by reacting a low amount of soy protein into a particular urea-formaldehyde resin during its preparation, a wood composite adhesive is produced that has enhanced tackiness and improved strength (see especially paragraphs **[17]**, **[36]** and **[52]**). As described in the sole Example, an improvement in internal bond was observed using only 1% soy flour.

One of the benefits of enhanced adhesive (resin) tack, as appreciated by those skilled in the art, is that in cases where a minimum level of adhesive (resin) usage is required to attain the minimum acceptable prepress strength of the composite before ultimate heat/pressure consolidation, one is able to employ a lower amount of adhesive (resin) (lower adhesive usage) as the tackiness of the adhesive (resin) is increased. Thus, rather than using the same amount of adhesive (resin) to potentially obtain an increased internal bond (IB) strength, especially where an increased IB is not needed, one can instead use a smaller amount of adhesive (resin) to obtain a satisfactory bond strength, since with the tackier adhesive (resin) a smaller amount of adhesive (resin) is able to provide a pre-pressed composite board with sufficient strength for handling prior to final consolidation. In this way, there is a significant cost savings as the overall level of adhesive (resin) usage is reduced.

**The Rejection of Claims 1, 2 5, 6, 8 and 9 under 35 U.S.C. § 103(a)**

Claim 1 (and remaining dependent claims 4 and 5 stand rejected based solely on U.S. 4,282,119 (Tinkelenberg) Applicants respectfully traverse this rejection.

To establish a *prima facie* case of obviousness, the prior art reference (or references when combined) must teach or suggest all the claim limitations. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). (emphasis added).

As recognized in the prior Office Action, Tinkelenberg describes using certain proteins dissoluble or dispersible in the resin solution. The only proteins identified by Tinkelenberg are albumins such as blood albumin, desiccated blood, globulins, casein, hydrolized sludge from effluent water treatment plants and, possibly, partially hydrolized cell material obtained from cultures of micro organisms. In view of its price and availability Tinkelenberg preferred blood albumin. Vegetable protein and especially soy protein, now recited in claim 1, are not identified or in any way suggested.

While Tinkelenberg broadly suggests that the noted protein sources can be used in an amount between 2 and 20% by weight of resin solids and that best results are obtained with a quantity of 5-10% by weight (Col. 2, lines 32-34), all of the actual examples use an amount of protein of 10% by weight (See Table at column 4). Thus, Tinkelenberg focuses the skilled worker on using an amount of its different protein at a level above the range defined by pending claim 1 and particularly above the range defined by new claim 19.

The advantage Tinkelenberg ascribes to the use of these proteins in the adhesive also does not suggest or make obvious the enhanced tackiness benefit observed by applicants in the subject application. In particular, Tinkelenberg claims that the use of its different protein provides a retention of moisture resistance (boiling water resistance) and a lowering of formaldehyde emission in the U-F and M-U-F resins. Tinkelenberg does not disclose or suggest that either an improvement in internal bond strength, or especially an improvement in the tack properties of the adhesive binder are possible at the low level of soy protein addition required by the pending claims.

Importantly, Tinkelenberg teaches only that the protein is mixed into the resin solution shortly before processing and distributed uniformly by stirring. Tinkelenberg suggests that in most cases the protein need only be dispersed in the solution. There is

absolutely no suggestion of reacting the protein with formaldehyde during the actual synthesis of the resin. The resin actually is prepared separately (see especially column 2, line 39 to column 3, line 19) before the protein is added. See especially Example 1 of Tinkelenberg. As appreciated by those skilled in the art, the point at which the protein is added affects the structure of the resulting resin and the properties of the resulting binder and accordingly the properties of the resulting composite.

Tinkelenberg discloses that the addition of a protein which is dissoluble or dispersible **in the resin solution** has a positive effect on the weather resistance of the chipboard, **if** the resin has a low $F/NH_2$ molar ratio, *i.e.,* 0.45 to 0.65. This mole ratio range corresponds to an F:U mole ratio range of 0.9:1 to 1.3:1.

Tinkelenberg also teaches that there is no advantage to using protein addition generally since with the commonly used adhesives, *i.e.,* resins made at an $F/NH_2$ molar ratio of between 0.70 and 0.85, the addition of a protein produces only a limited non-essential improvement. This mole ratio range corresponds to an F:U mole ratio range of 1.8:1 to 2.6:1.

Tinkelenberg neither discloses, nor suggests that there is any benefit to adding the protein at the time of resin synthesis. Clearly, there is no recognition that the addition of a protein under proper conditions improves resin tack. Adding the protein to a previously synthesized resin does not make it obvious to add it at the time the resin is prepared. Indeed, Tinkelenberg suggests that there is no real benefit to having any protein present at the preferred mole ratio for synthesizing the resin according to the present invention in any event, so why would one include the protein at all, let alone at a different time than described by Tinkelenberg. Tinkelenberg simply does not make applicants claimed invention obvious.

The Office Action remarks the recitation of adding the soy protein during resin synthesis is related to a process and not the composition. This observation overlooks that clear impact of reaction dynamics on resin structure and properties. Those skilled in the art recognize that the product formed when components A (urea), B (formaldehyde) and C (soy

protein) are allowed to co-react (in accordance with the invention defined by the pending claims) is different from a product formed when components A (urea) and B (formaldehyde) are first reacted to product a U-F resin polymer and only after resin polymer formation is component C (the protein) added. The extent of reaction between the protein and free formaldehyde and the interaction of formaldehyde-protein adducts with free urea that occur as a consequence of the reaction sequence defined by the pending claims is fundamentally different than in a circumstance where a preformed U-F resin is blended with protein and then reacted during final resin cure. The recited process differences impact significantly the nature of the product and its properties.

**The Rejection of Claims 3 & 4 under 35 U.S.C. § 103(a)**

Claims 3 and 4 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Tinkelenberg et al (U.S. 4,282,119) as applied to claim 1 above and further in view of Guilbert et al, U.S. Pub. App. 2004/0062920. Applicants respectfully traverse this rejection.

While claim 3 has been canceled, claim 4 remains pending.

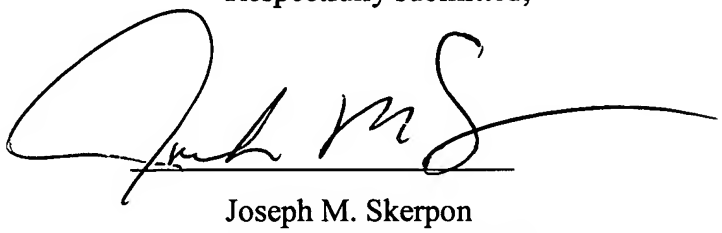
The secondary Guilbert publication discloses using a "powdery protein adhesive binder." The published application describes using the powdery protein "as the sole binder component" and thus the essential U-F resin constituent of the present invention (and of the primary reference) is nowhere mentioned. There is nothing in the disclosure of the Guilbert publication suggesting its combination with Tinkelenberg. Guilbert has been selected inappropriately by virtue of an improper hindsight evaluation of the pending application. Nothing in Guilbert suggests that any of its teachings should be combined with Tinkelenberg. Moreover, even when viewed in combination, none of the subject matter embraced by the pending claims is rendered obvious. Nothing in either reference suggests that an advantageous tack improvement or internal bond enhancement for a wood adhesive could be obtained if the protein is present at the lower levels defined by the claims during the initial synthesis of the U:F resin in excess formaldehyde. The Guilberg reference having failed to teach anything at all about U:F resins, clearly does not make obvious the subject

invention which requires the presence of the protein during the resin synthesis.

## CONCLUSION

Accordingly, in view of the above amendments and remarks, this application is believed to be in condition for allowance, and a written indication of the same is respectfully requested.

Respectfully submitted,



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